1. Place the following in order from smallest to largest.
   1 - tissue  2 - organ  3 - molecule  4 - cell  5 - organelle
   a. 3, 5, 4, 1, 2
   b. 3, 4, 1, 5, 2
   c. 5, 3, 1, 4, 2
   d. 2, 3, 5, 4, 1
   e. 5, 4, 3, 2, 1

2. Which of the following is the correct sequence of information flow in a control system?
   a. receptor → effector → control center
   b. control center → effector → receptor
   c. effector → receptor → control center
   d. receptor → control center → effector
   e. control center → receptor → effector

3. Which of the following is an example of a positive feedback system (loop)?
   a. An increase in blood glucose levels stimulates the release of insulin from the pancreas which in turn
      causes a decrease in blood glucose levels.
   b. Exercise causes an increase in body temperature which causes you to sweat resulting in a decrease in
      your body temperature.
   c. An injury to a blood vessel stimulates the production of a small blood clot, which becomes progressively
      larger and larger until bleeding is stopped.
   d. Suddenly sitting up from a laying position causes a decrease in blood pressure, this causes an increase in
      heart rate, which results in an increase in blood pressure.
   e. Streaking in the middle of January causes a decrease in core body temperature, the hairs on your arms
      and legs stand on end to increase your insulation causing a rise in your body temperature.

4. The type of control system which opposes the change of a variable is called a:
   a. homeostatic loop.
   b. positive feedback loop.
   c. reverse feedback loop.
   d. feed forward loop.
   e. negative feedback loop.

5. Which of the following characteristics best describes Hydrogen (H) bonds?
   a. They can keep 2 (two) or more molecules close to one another.
   b. They are weak compared to covalent bonds.
   c. They can stabilize the shape of a molecule.
   d. They can only be made between hydrogen and an electronegative atom.
   e. All of the above.
6. ___________ is the property of water that causes it to be attracted to itself.
   a. Cohesion  
   b. Solvency  
   c. Adhesion  
   d. Heat capacity  
   e. Buffering capacity

7. Organic molecules are those that are based on the element of ___________.
   a. Nitrogen  
   b. Oxygen  
   c. Hydrogen  
   d. Carbon  
   e. Phosphorous

8. A molecule that is polar is considered to be ____________.
   a. hydrophilic  
   b. lipophilic  
   c. “lipid loving”  
   d. “water fearing”  
   e. none of the above

9. When ATP breaks down to ADP + P, potential energy stored in bonds is released. This energy stored in bonds is referred to as __________ energy.
   a. electromagnetic  
   b. electrical  
   c. chemical  
   d. kinetic  
   e. heat

10. Which of the following is (are) hydrophilic?
    a. cholesterol  
    b. ions  
    c. triglycerides  
    d. unsaturated fatty acids  
    e. all of the above

11. Which of the following is an energy source used by a cell?
    a. heat  
    b. electrical  
    c. mechanical  
    d. chemical  
    e. all of the above

12. ___________ are made, broken or rearranged during every biochemical reaction.
    a. Cells  
    b. Atoms  
    c. Bonds  
    d. Friends  
    e. None of the above
13. Catalysts _________ the rate of chemical reactions by _________ the activation energy.
   a. decrease; raising
   b. increase; lowering
   c. decrease; lowering
   d. increase; raising

14. _________ reactions build one large molecule by combining multiple molecules.
   a. Exchange
   b. Synthesis
   c. Catabolic
   d. Decomposition
   e. Hydrolysis

15. Which of the following describes a decomposition reaction?
   a. the hydrolysis of a protein into amino acids
   b. the synthesis of DNA from nucleotides
   c. the conversion of glucose molecules into glycogen
   d. the denaturation of a protein
   e. all of the above

16. Which of the following equations depicts an exchange reaction?
   a. AB → A + B
   b. A + B → AB
   c. AB + CD → AC + BD
   d. AB → A^+B^+
   e. A + B → AB → C + D

17. A polymer is broken down to monomers by the process of ___________.
   a. dehydration synthesis
   b. hydrolysis
   c. oxidation-reduction
   d. magic
   e. denaturation

18. Which of the following conditions would decrease the rate of a chemical reaction?
   a. an increase in temperature
   b. an increase in the concentration of reactants
   c. the removal of a catalyst
   d. all of the above
   e. none of the above

19. Carbohydrates:
   a. are a group of molecules whose monomers are called disaccharides.
   b. are used as a fuel to synthesize molecules of ATP within cells.
   c. are stored in plant cells in the form of triglycerides.
   d. are considered to be molecules of instruction and inheritance.
   e. have names that typically end with the suffix “-ase”.
20. What is the major function of carbohydrates in the body?
   a. They act as enzymes to speed up chemical reactions.
   b. They are the molecules of instruction and inheritance.
   c. They provide structure to the body by holding it together.
   d. They provide the primary source of fuel for a cell to make energy.
   e. They allow polar molecules to move through a cell membrane.

21. The chemical formula C₆H₁₂O₆ means:
   a. there are 6 calcium, 12 hydrogen and 6 oxygen atoms.
   b. there are 6 carbon, 12 helium and 6 oxygen atoms.
   c. the substance is a nucleic acid.
   d. there are 6 chloride, 12 hydrogen and 6 oxygen atoms.
   e. none of the above.

22. Which of the following is part of all amino acids in terms of their structural formula?
   a. hydroxyl group (OH)
   b. deoxyribose
   c. phosphate group (PO₄⁻)
   d. nitrogen containing base
   e. amino group (NH₂)

23. Why are the functions of 2 different enzymes not the same?
   a. Different proteins have different shaped active sites.
   b. Different enzymes recognize different substrates.
   c. Different enzymes have different tertiary structures.
   d. Different enzymes have different primary structures.
   e. All of the above.

24. The ________ is the part of an enzyme that recognizes a specific substrate.
   a. active site
   b. alpha helix
   c. amino group
   d. peptide bond
   e. beta sheet

25. The process by which the activity (functionality) of a protein is lost due to a drastic change in its 3D (3-dimensional) shape is called:
   a. dehydration synthesis.
   b. ionization.
   c. oxidation.
   d. denaturation.
   e. reduction.

26. All fatty acid molecules contain ____________ carbon atoms.
   a. no
   b. an even number of
   c. more oxygen atoms than
   d. double bonded
   e. exactly 6
27. A fatty acid molecule that has a double bond between 2 adjacent carbon atoms is:
   a. a monosaccharide.
   b. unsaturated.
   c. polar.
   d. saturated.
   e. a nucleotide.

28. A triglyceride is made by bonding ____________ and ____________.
   a. cholesterol, fatty acids.
   b. fatty acids, glycerol.
   c. glucose and cholesterol.
   d. cholesterol, amino acids.
   e. water, fatty acids.

29. Phospholipids are amphiphilic which means that they:
   a. provide a form of chemical energy.
   b. have both polar and nonpolar characteristics.
   c. can exist as either a liquid or a solid at room temperature.
   d. can be converted into carbohydrates or proteins or nucleic acids.
   e. none of the above.

30. A nucleotide consists of
   a. a sugar and a phosphate group.
   b. a sugar and a nitrogenous base.
   c. a phosphate group and a nitrogenous base.
   d. a sugar, a nitrogenous base, and a phosphate group.
   e. a sugar and an amino acid.

31. Which of the following is a nucleotide found only in a molecule of RNA?
   a. Adenine
   b. Guanine
   c. Uracil
   d. Thymine
   e. Cytosine

32. How many nucleotide strands make up a single molecule of RNA?
   a. 1
   b. 2
   c. 3
   d. 4

33. Which of the following is NOT a structural component of the cell membrane?
   a. glycolipids
   b. nucleic acids
   c. peripheral proteins
   d. glycoproteins
   e. cholesterol
34. The addition of carbohydrates to a protein to create a glycoprotein occurs in the ___________.
   a. mitochondria
   b. Golgi complex
   c. nucleus
   d. lysosome
   e. smooth endoplasmic reticulum

35. The ___________ create/synthesize proteins that function inside of a cell.
   a. Golgi complex
   b. free ribosomes
   c. nucleus
   d. lysosomes
   e. smooth endoplasmic reticulum

36. What function would immediately cease if the ribosomes of a cell were destroyed?
   a. organelle hydrolysis
   b. lipid synthesis
   c. ATP synthesis
   d. protein synthesis
   e. protein modification

37. The innermost region of the mitochondria is called the ____________.
   a. inner mitochondrial membrane
   b. cytoplasm
   c. cristae
   d. matrix
   e. intermembrane space

38. What is a function of the nucleus of a cell?
   a. It synthesizes ATP.
   b. It synthesizes proteins to be exported out of the cell.
   c. It modifies proteins.
   d. It holds molecules of DNA.
   e. It stores intracellular calcium (Ca^{2+}).

39. The cellular organelle which is responsible for synthesizing the most ATP is the ____________.
   a. cell membrane
   b. nucleus
   c. mitochondria
   d. endoplasmic reticulum
   e. none of the above

40. What is the function of a lysosome?
   a. It hydrolyzes old/worn out organelles.
   b. It synthesizes phospholipids.
   c. It synthesizes ATP.
   d. It stores molecules of DNA.
   e. It synthesizes proteins.
Section 2
Answer the true/false questions 41 – 55 on the scan sheet (A = True, B = False).

41. Covalent bonds are weaker than hydrogen bonds.

42. Amino acids are the monomers of nucleic acids.

43. Cholesterol is a nonpolar molecule.

44. Hydrolysis is a type of catabolic reaction.

45. The name of enzymes ends with the suffix “ase”.

46. Molecules of DNA (deoxyribonucleic acid) are made from 5 different monomers.

47. The extracellular fluid (ECF) is also known as the cytosol.

48. Cholesterol is a hydrophobic molecule.

49. A molecule of adenosine triphosphate (ATP) is most similar in structure to a molecule of cholesterol.

50. Non-essential amino acids can only be obtained through the diet (eating).

51. Nucleic acids are the largest molecules in the body.

52. An alpha (α) helix is a secondary structure of proteins.

53. The peripheral membrane proteins of the plasma membrane are capable of detaching from the membrane to interact with molecules within the interior of the cell.

54. Mitochondria have 2 separate membranes, an inner and an outer.

55. The synthesis of lipids, the storage of intracellular calcium (Ca^{2+}) and the detoxification of the cell are the jobs of the Golgi complex.